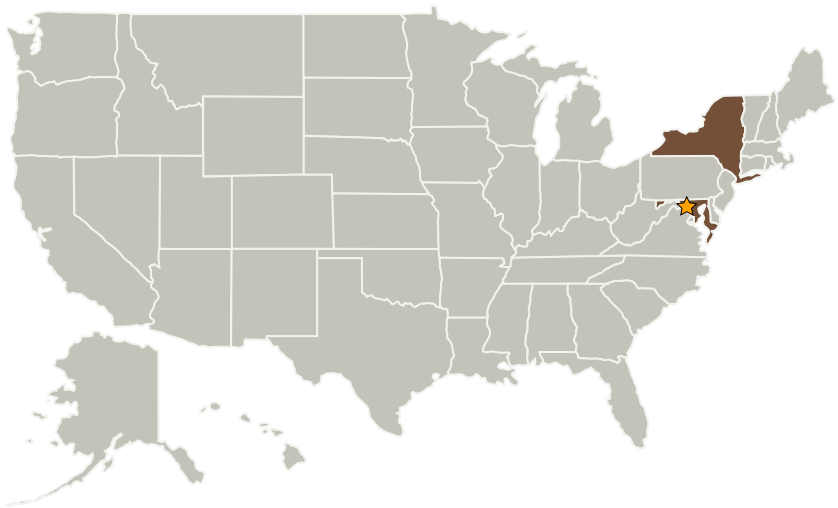
Subaperture Stitching Interferometry for Large Convex Aspheric Surfaces, Phase I

Completed Technology Project (2005 - 2005)

Project Introduction

The size and accuracy specifications of telescope mirrors are ever more demanding. This is particularly true for secondary mirrors, as they are convex and thus require large-aperture optics to test them. Subaperture stitching has the potential to provide accurate high-resolution maps of large-aperture aspheric optics without the use of dedicated nulls. QED has already developed the subaperture stitching interferometer (SSI), which combines a vertical workstation with a commercially-available 4" or 6" interferometer. Nanometer-level accuracies have been obtained on spherical optics by optimally compensating subaperture placement errors, as well as automatically calibrating for systematic errors such as reference wave error and distortion. Non-null capability is enhanced since the individual subapertures have significantly less aspheric departure. However, the system is currently only capable of testing up to 280 mm optics of mild asphericity. This proposal focuses on innovations for leveraging these considerable benefits of stitching (high resolution, automatic calibration, and flexible aspheric testing) to larger and more aspheric optics. Activities will include novel stitching strategies to calibrate for gravitational deformations, adaptive asphere calibration methods, specialised platform designs, and subscale testing. This will enable more cost-effective production of convex secondary mirrors and facilitate the testing of long-radius concaves, and even of assembled systems).

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
QED Technologies, Inc.	Supporting Organization	Industry	Rochester, New York

Primary U.S. Work Locations	
Maryland	New York

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Paul D Murphy

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.2 Observatories
    - TX08.2.1 Mirror Systems